Project No. A-100

THICKNESS MEASUREMENT OF NON-METALLIC MATERIALS

Progress Report No. 5

for

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June 10, 1957

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THICKNESS MEASUREMENT OF NON-METALLIC MATERIALS

I. INTRODUCTION

This is a report of the work done on [redacted] Project No. A-100 during the period of May 1 to May 31, 1957. The purpose of this project is to develop an ultrasonic method of determining the thickness of non-metallic materials. Two possible methods for this determination are the pulse-echo technique, in which is measured the time required for a pulse to travel through the material and return after reflection, and the resonance technique, in which the resonant frequencies of the sample are measured. One measurement by either method would allow the determination of the sample thickness to the accuracy with which the velocity of sound in the sample is known. If a second measurement can be taken after removing a known thickness of the material the uncertainty caused by a lack of knowledge of the exact velocity can be eliminated.

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The working samples have been one foot square blocks of concrete which are three inches or six inches thick. In order to overcome the attenuation problems, frequencies below 200 kilocycles per second are used. The small cross-sectional area of the sample gives rise to problems with reflections from the ends or resonances due to the transverse dimensions. However, it was felt that one should be able to make the measurement under these conditions or the method would not be satisfactory.

II. PRESENT WORK

During the period covered by this report, [redacted] visited the [redacted]

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The work at [redacted] is limited to larger samples than we can consider - thicknesses of at least six inches and areas involving many square feet. Their results to date indicate

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that the resonance method is satisfactory for their purposes, but is difficult, if not impossible, on samples of the size we are considering. For this reason, our efforts will continue to be primarily concerned with the pulse-echo method. Much of our effort is still directed toward the problem of achieving optimum damping. Experiments on damping by means of a solid attached to the crystal are nearly complete and will be reported on fully next month. However, it has been found that damping by a viscous liquid may be even more promising, and the liquid may also allow better coupling of the transducer to the sample.

Preliminary experiments indicate that good damping medium is a cellulose gum (such as CMC-70, manufactured by Hercules Powder Company) dissolved in water. However, the water may affect the housing, causing problems in the field. For this reason, a substitute is being sought.

III. FUTURE WORK

During the next month the investigation of damping by means of attached solid will be completed. The damping caused by CMC-70, as well as by other liquids, will be investigated to determine the mechanism of damping and the most suitable liquid.

IV. NOTEBOOKS

The work reported here is recorded in [redacted] Notebooks No. C-6529 and C-6880. 25X1

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V. CONTRIBUTING PERSONNEL

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The project is under the supervision of [redacted] The work reported here was done by [redacted] and [redacted] 25X1

Respectfully submitted, 25X1

[redacted]

APPROVED:

[redacted] 25X1

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